



Multiple Adits at the Donald Duck 2 Mine (LM ID 5968), Henry Mountains Field Operations Plan

DEFENSE-RELATED URANIUM MINES ANNUAL REPORT

January 1 – December 31

2020

Table of Contents

Purpose.....	3
Background.....	3
Program Objectives, Scope, and Methods.....	3
Verification and Validation Summary.....	5
Programmatic Accomplishments.....	13
Risk Screening.....	20
Safeguarding.....	21
Strategic Partnerships.....	21
2021 Planned Activities.....	22
Program Plans.....	23
Abbreviations List.....	25
Additional Information.....	26
References.....	26

Purpose

The purpose of this document is to present the 2020 annual report for the U.S. Department of Energy (DOE) Office of Legacy Management (LM) Defense-Related Uranium Mines (DRUM) Program. It provides details on 2020 program activities and accomplishments, project planning for 2021, and an updated program timeline. Additional information on the program is presented in other documents available through the contact information provided at the end of this report.

I Background

The 2014 *Defense-Related Uranium Mines Report to Congress* (DOE 2014) (Report to Congress) identified 4,225 purchase records in 19 states, revealing an unknown magnitude of liability from a unique set of abandoned uranium mines in the United States. These mines provided uranium ore to the U.S. Atomic Energy Commission (AEC) for defense-related activities that occurred between the years 1947 and 1970. In response to this Report to Congress, LM initiated DRUM Campaign 1 in 2017 to conduct verification and validation (V&V) activities of existing mine information and collect screening level site-specific data at approximately 2,500 legacy mines on public land administered by federal and state agencies. Campaign 2 is scheduled to commence field V&V work in fiscal year (FY) 2023 and will assess DRUM sites on tribal land. Campaign 3, which will address DRUM sites on private property, is scheduled to begin field V&V work in FY 2024.

II Program Objectives, Scope, and Methods

The DRUM Program mission is to identify DRUM sites that pose unacceptable risks to human health and the environment and improve strategies for allocation of government resources to address these risks. The DRUM Program mission is fourfold: (1) correlate individual mines with ore production and location information, (2) inventory and complete screening-level sampling of mine sites, (3) identify those sites that pose unacceptable risks to human health and the environment, and (4) evaluate the liabilities afforded by each mine screened. A subsidiary benefit of the program is that it provides the opportunities to improve strategies for allocation of government resources to quantify and address identified risks.

The DRUM Program supports LM’s strategic goal of “protecting human health and the environment” (Goal 1), and its strategic objective to “address the environmental legacy of defense- related uranium mining and milling sites” (DOE 2020a).

In support of these goals, the objectives of the DRUM Program are to:

1. Share existing information and collect site-specific data at each mine to identify physical safety hazards or human health and environmental risks.
2. Perform program-specific risk scoring and ranking of these mine hazards.
3. Improve the data quality and content of the DRUM Program database and partner agency databases.
4. Exchange program results and information with federal, tribal, and state governments.
5. Quantify the liabilities posed by these sites and work with partner agencies to leverage resources to address mines with priority physical safety hazards.

The V&V process is composed of three sequential steps: (1) reconciliation, (2) field inventory and environmental sampling, and (3) technical report preparation. These comprise the scope and methods utilized for the V&V process to achieve program objectives.

In the reconciliation step, available data are reviewed to assess the location, ownership, and land management status of the mine. This includes reviewing AEC ore purchase records, company records, available mine maps, and federal and private libraries and collections. Typical challenges encountered during reconciliation include inaccurate location information, duplicate records, multiple mines listed under one record, and missing records. In some cases, mine locations remain in an unknown status until additional data are found. The reconciliation process ensures that the most accurate location data are available to field teams before conducting field validation activities. As mines in designated geographic areas are reconciled, they are compiled into project areas that are used by land management agencies and field teams to coordinate field activities.

In the field inventory and environmental sampling step, field teams are deployed to locate the mine site and map the existing features (e.g., adits, shafts, structures, waste rock piles). These activities include describing physical mine conditions, identifying mining-related features, assessing the physical hazards posed by each feature, evaluating ecological and environmental hazards, and assessing the ease of public access to the mine and signs of recent recreational use. Environmental samples are collected to determine the presence of selected radionuclides and chemicals in waste rock, soil, sediment shed areas, and surface water (when present). In addition, environmental sampling includes performing a gamma radiation survey of the disturbed area of the mine. Field data and observations are used to perform risk rankings for each mine. Data are electronically collected and recorded and undergo a rigorous quality assurance/quality control process before being uploaded into the DRUM Program database.

In the report preparation step, V&V reports are developed for each mine. Each report summarizes the V&V efforts that: (1) confirmed the current conditions and location of the mine; (2) recorded information associated with mine features, such as adits, shafts, and waste rock piles; and (3) provided the primary hazard rankings for physical hazards and potential risks to human health and the environment. Additional factors that influence risk rankings, such as current ecology and ease of public access, are also included in each report. Risk screening is a systematic approach to evaluating risks associated with the mines. Risk screening information is conveyed to partner agencies via risk roll-up reports. An outgrowth of these activities is safeguarding physical safety hazards which were identified during V&V operations and subsequently evaluated and documented during risk roll-up reporting.

Subsequent to completing the V&V steps, LM collaborates with its partner agencies as a cohesive team to safeguard physical safety hazards posed by remnant mining-related features at DRUM sites. Safeguarding involves construction of barricades designed to prohibit public access to hazardous adits, shafts, subsidences, hazardous highwalls, and other excavated mine features. It may also remove or secure dilapidated structures. Hazardous features are identified and mapped in the field during V&V activities undertaken by the DRUM Program field teams. The scope and relative degree of hazard presented by each feature are documented in risk roll-up reports prepared by the DRUM Program for use by land management agencies.

III Verification and Validation Summary

This section presents a summary of 2020 program V&V activities and accomplishments. DRUM teams completed field visits at 417 mine locations in 2020. In addition, 191 records were removed from the database during the reconciliation process since they were redundant records of the same mine (i.e., duplicate records). A summary of mine reconciliation and field V&V activities is presented in Table 1.

Table 1. Summary of Verification and Validation Activities

State	Duplicates Removed ^a		Field V&V Complete ^b		Total V&V Complete ^c	
	2020	Project to Date	2020	Project to Date	2020	Project to Date
Colorado	119	412	192	493	311	905
Utah	8	349	225	668	233	1,017
Arizona	57	68	-	-	57	68
Wyoming	-	77	-	38	-	115
New Mexico	-	43	-	60	-	103
South Dakota	-	26	-	26	-	52
Texas	7	7	-	-	7	7
California	-	4	-	-	-	4
Nevada	-	2	-	-	-	2
Montana	-	4	-	-	-	4
Other States ^d	-	7	-	-	-	7
Total	191	999	417	1,285	608	2,284

Notes:

^a Duplicates Removed is the process of eliminating redundant (duplicate) records from the DRUM database, when more than one record references the same mine. In addition, non-DRUM sites, when removed from the database, are included in the count of duplicate records. In 2020, 502 mine records were reviewed; 191 of these (38%) were duplicate records. Since program inception, 3,119 mine records have been reviewed; 999 of these (32%) were duplicate records.

^b Field V&V Complete is the number of mine site visits accomplished.

^c Total V&V Complete is the number of field V&V completed added to the number of duplicate mines eliminated from the database.

^d Other states include North Dakota, Idaho, Oregon, Oklahoma, Alaska, Florida, New Jersey, and Pennsylvania.

Lessons learned from the 2019 field season led to improvements in 2020 field inventory methodology and refinements to mine V&V protocols to ensure consistency in application of program data collection standards. The *Defense-Related Uranium Mines Verification and Validation Work Plan* (April 2020) (V&V Work Plan) was updated to incorporate these changes.

Field V&V operations are organized into logical project areas. The project areas are termed Field Operations Plan (FOP) areas for ease of reference. The following is a summary of the status of FOP activities conducted in 2020 by state.

Colorado

Bull Canyon – UFO FOP: This project area is primarily in Montrose County in southwestern Colorado. It includes mines on U.S. Bureau of Land Management (BLM)–administered land and on mixed-ownership (private and BLM-administered) land. Approximately 35 V&V operations were completed in 2020 at 42 mines on public and mixed ownership land in this FOP area. Two mines on public land remain to be visited in 2021, which will complete work in this FOP area.

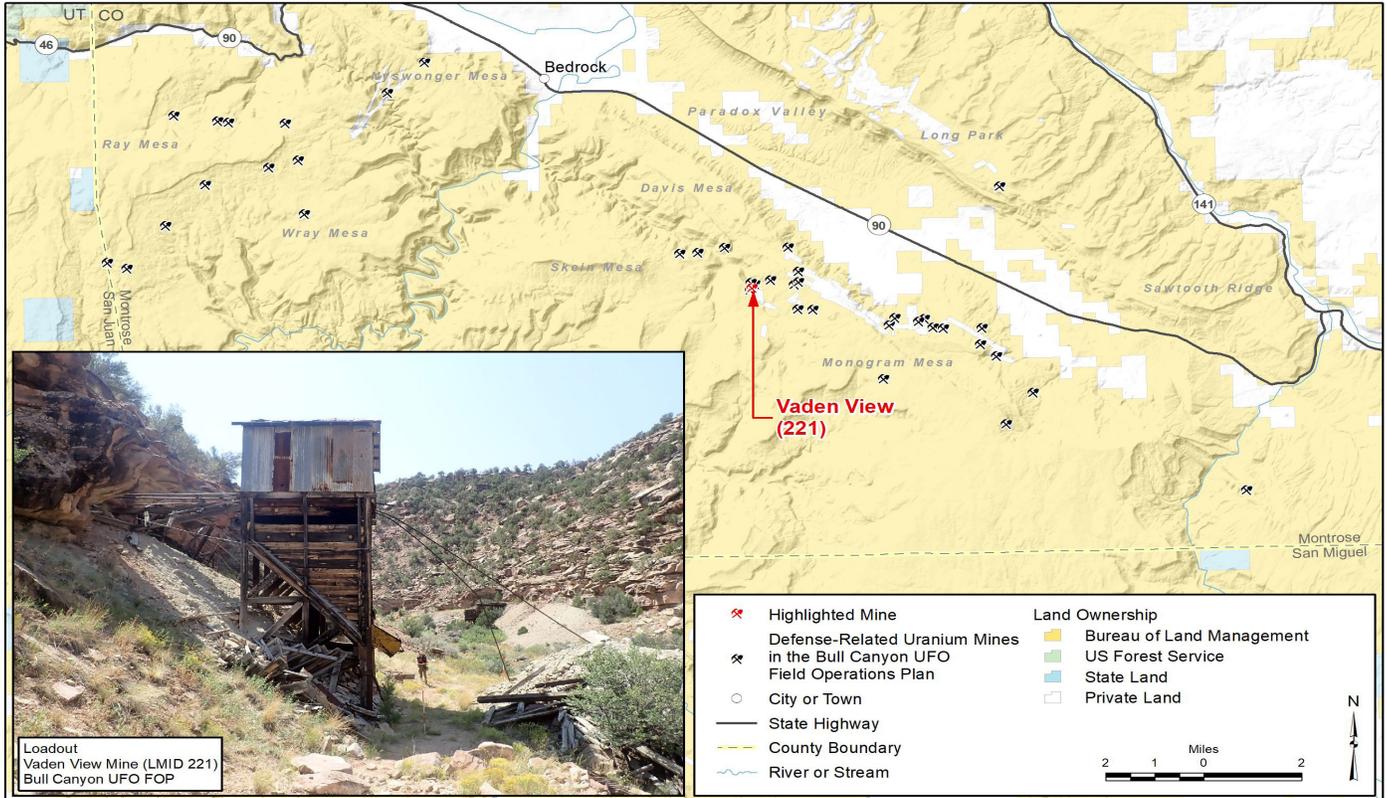


Figure 1. Map and Photo, Vaden View Mine Bull Canyon – UFO FOP.

Gateway FOP: This project area is in Mesa County in southwestern Colorado and Grand County in southeastern Utah. The FOP includes 205 mines on BLM-administered land, mixed-ownership land, and private property. Approximately 149 V&V operations were completed at mines on public land in this FOP area in 2020, concluding V&V activities on the public land portion of this project area.

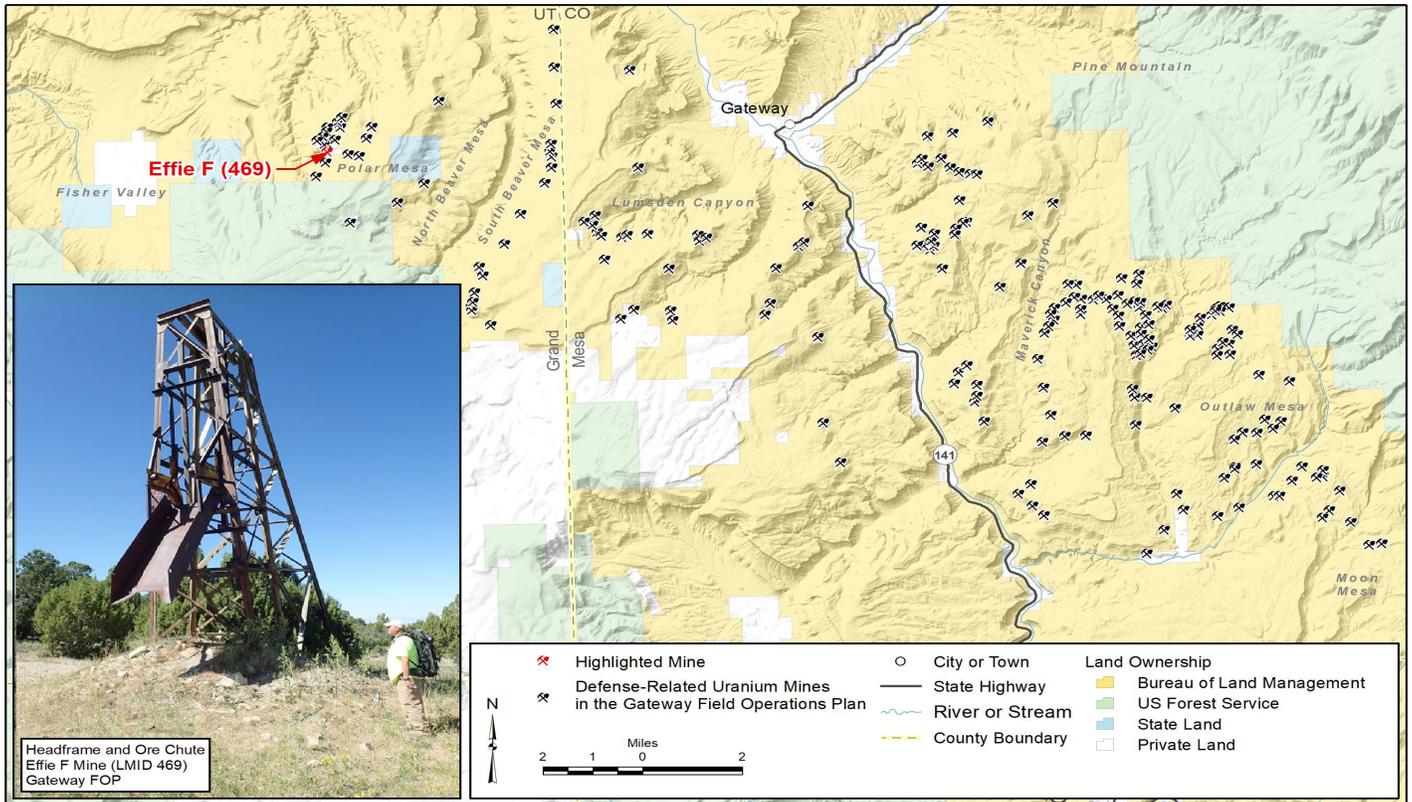


Figure 2. Map and Photo, Effie F Mine Gateway FOP.

Northern Montrose County FOP: This project area is in Montrose County in southwestern Colorado. A total of 92 mines on BLM-administered and mixed-ownership land. Some of these mines are located on land administered by the LM Uranium Leasing Program (ULP). Two mines were visited in 2020 field activities and the remaining two mines on public land will be completed in 2021.

Pilot Mines FOP: This project area covers portions of western Colorado and eastern Utah. It includes mines in the Bull Canyon, Moab, Paradox, Thompson, and Uravan mining districts of Colorado and Utah. Mines occur on public land managed by BLM, the U.S. Forest Service (USFS), and on private property. Forty-one of the Pilot mines are located on public land. The mines included in this FOP are those where initial DRUM data collection procedures were evaluated and refined in 2016 and early 2017. As a result, the initial data collection techniques were not comparable to those subsequently used for other DRUM sites. Most pilot mines were revisited in 2019 to ensure that all DRUM Program mines were evaluated using the same dataset criteria. One mine in this FOP was visited in 2020, concluding work in this area.

Uncompahgre Field Office (UFO) FOP: This project area is in Montrose County in southwestern Colorado. It includes 80 mines on BLM-administered land and mixed-ownership land. The 2020 field V&V work focused on mines on DOE Uranium Leasing Program (ULP) tracts. Nineteen of these mines were visited in 2020. Work on this FOP is now complete. In 2020, BLM in conjunction with the Colorado Division of Reclamation, Mining and Safety (Colorado DRMS) safeguarded 26 hazardous features inventoried during previous field V&V efforts.

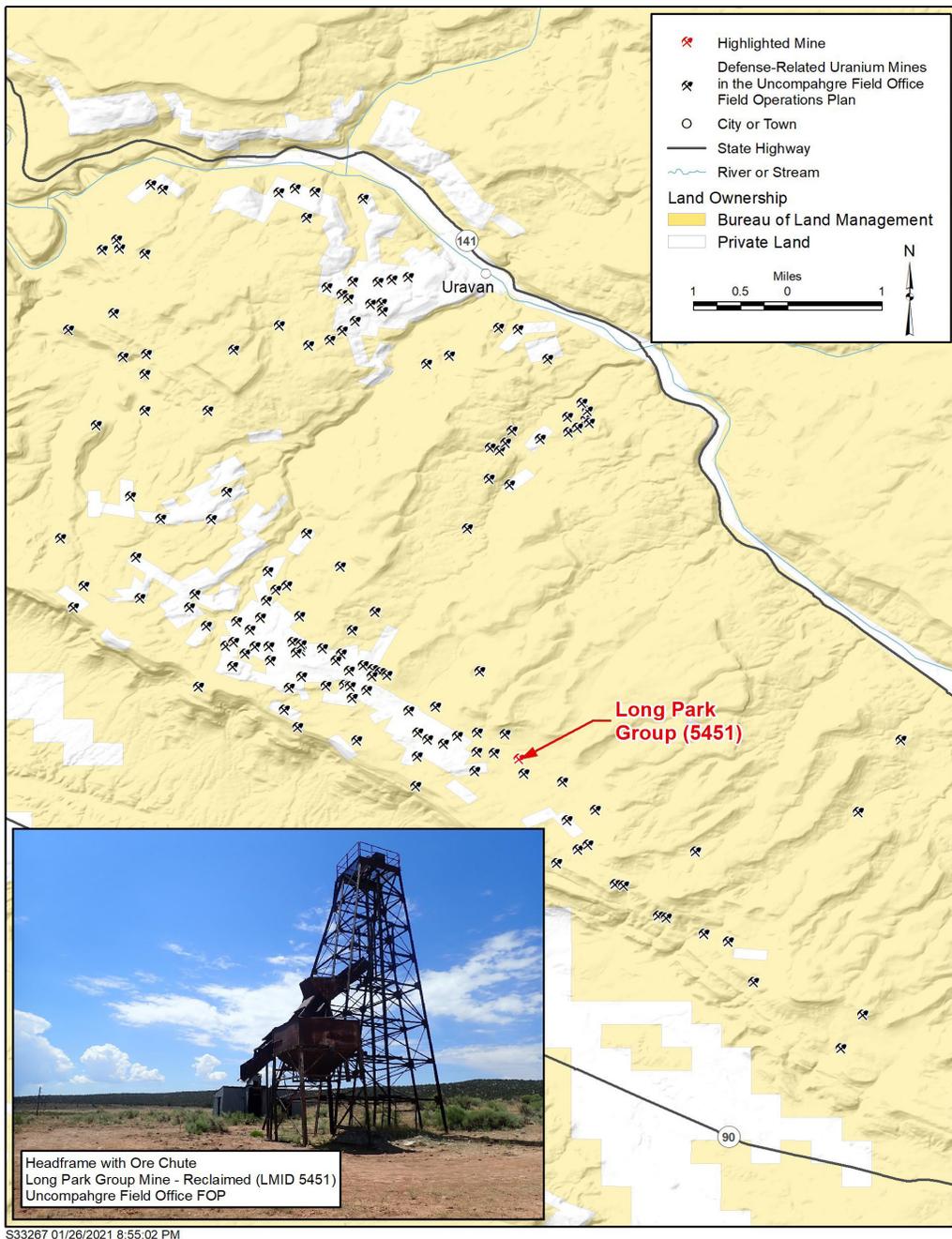


Figure 3. Map and Photo, Long Park Group Mine Uncompahgre Field Office (UFO) FOP.

Utah

Henry Mountains FOP: This project area is primarily located in Wayne County in south-central Utah. V&V work is focused on 125 mines located on public land managed by BLM, the USFS Dixie National Forest, and the Utah School and Institutional Trust Lands Administration (SITLA). Field activities have the potential to affect several federally listed plant species at certain times of the year. Therefore V&V operations are timed so that no adverse impacts on these species occur. Approximately 89 V&V site visits occurred in 2020. The remaining 36 mines will be visited in 2021 or 2022.

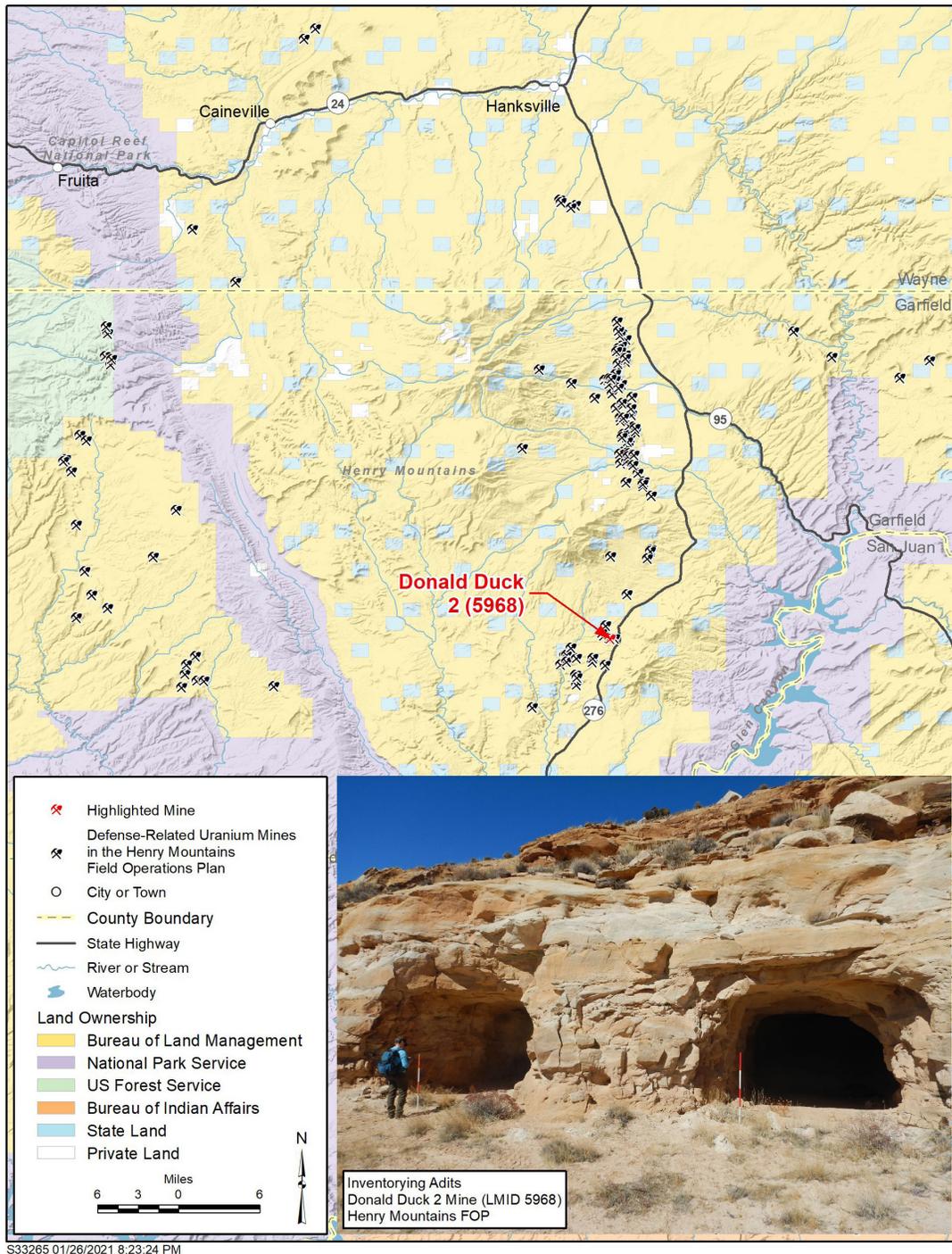


Figure 4. Map and Photo, Donald Duck 2 Mine Henry Mountains FOP.

Manti-La Sal National Forest FOP: This project area is in southeast Utah and southwestern Colorado. It includes 88 mines on National Forest System lands in the Moab and Monticello ranger districts, adjacent BLM-administered lands, SITLA public lands administered by the state of Utah, and mixed-ownership land. Field activities in this project area began in 2019. V&V operations were completed at two of the remaining mines in 2020. Four additional mines will be visited in 2021, completing the public portion of this FOP area.

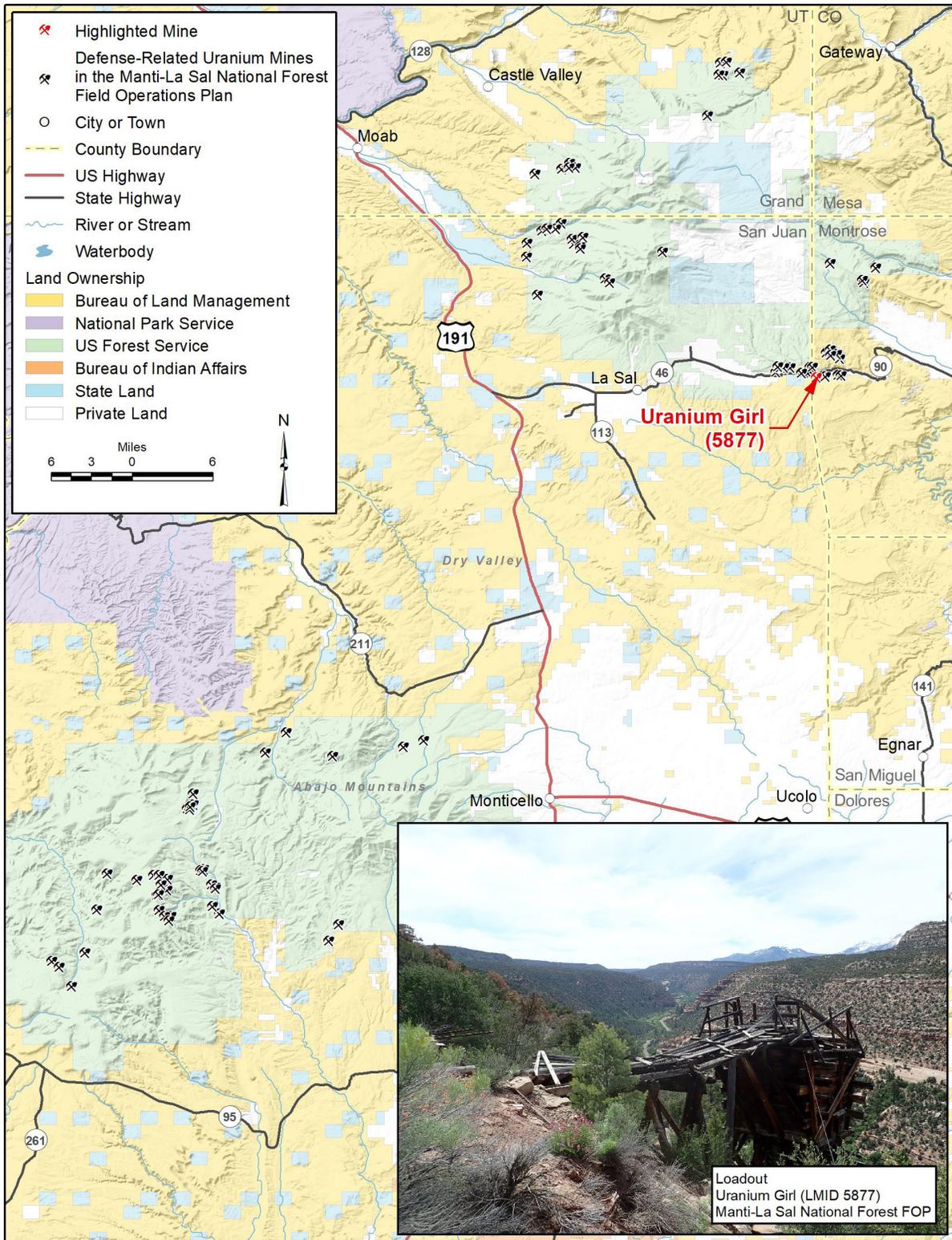


Figure 5. Map and Photo, Uranium Girl Mine Manti-La Sal National Forest FOP.

Moab Mining District FOP: This project area is primarily located in Grand County generally near Moab in southeastern Utah. V&V activities are being conducted on 39 mines on BLM-administered land, SITLA public land administered by the state of Utah, and mixed-ownership land. Four mines were visited in 2020 and the last remaining mine will be visited in 2021, completing field activities on public land.

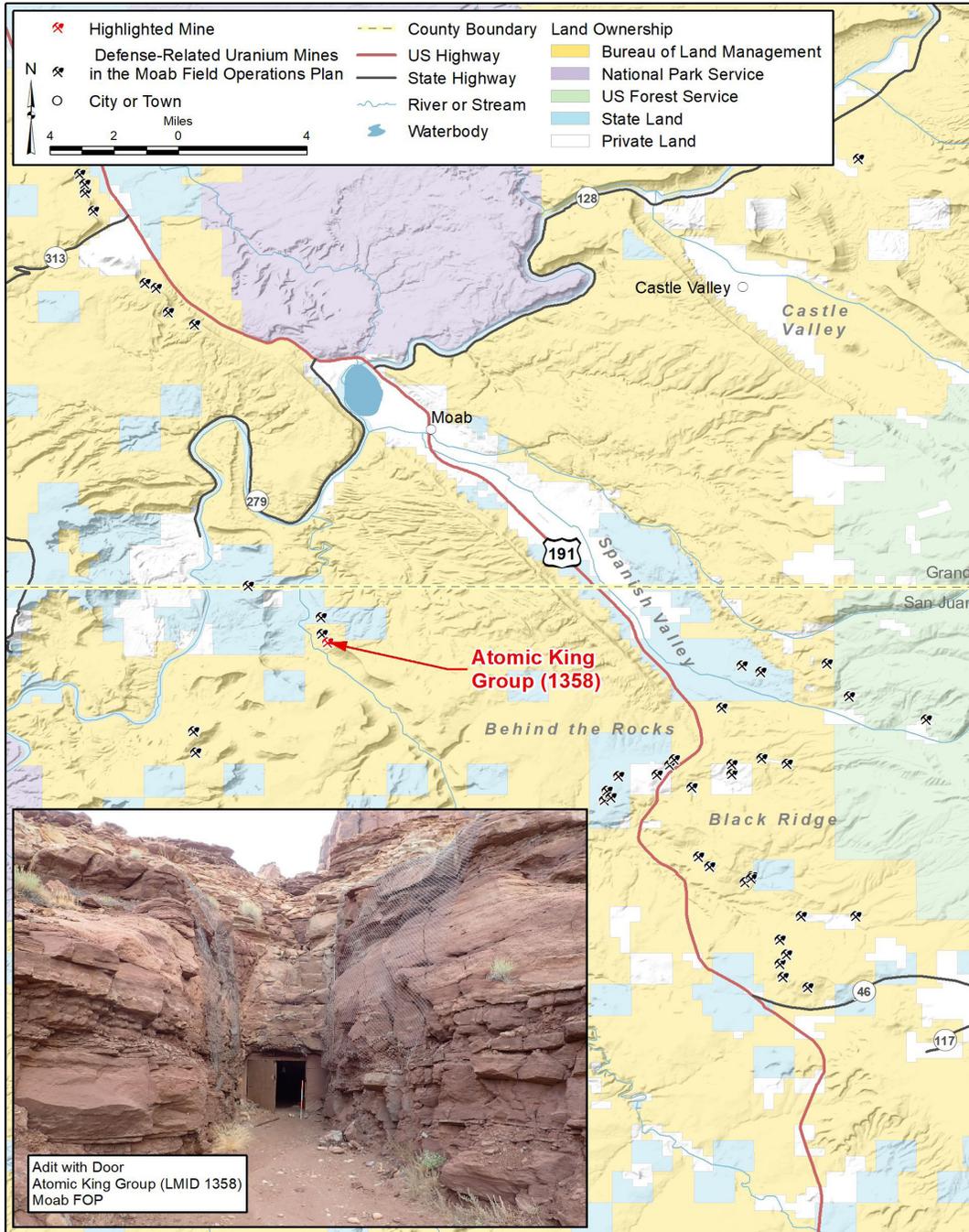


Figure 6. Map and Photo, Atomic King Group Mine Moab Mining District FOP.

Monticello FOP: This project area is primarily located in San Juan County in southeastern Utah. The 180 mines in this FOP area are mostly on BLM-administered land with some on SITLA public land administered by the state of Utah, and mixed-ownership land, and private land. Approximately 97 mines were visited in this FOP area in 2020. Field work will be completed at the remaining 80 mines situated on public land in 2021.

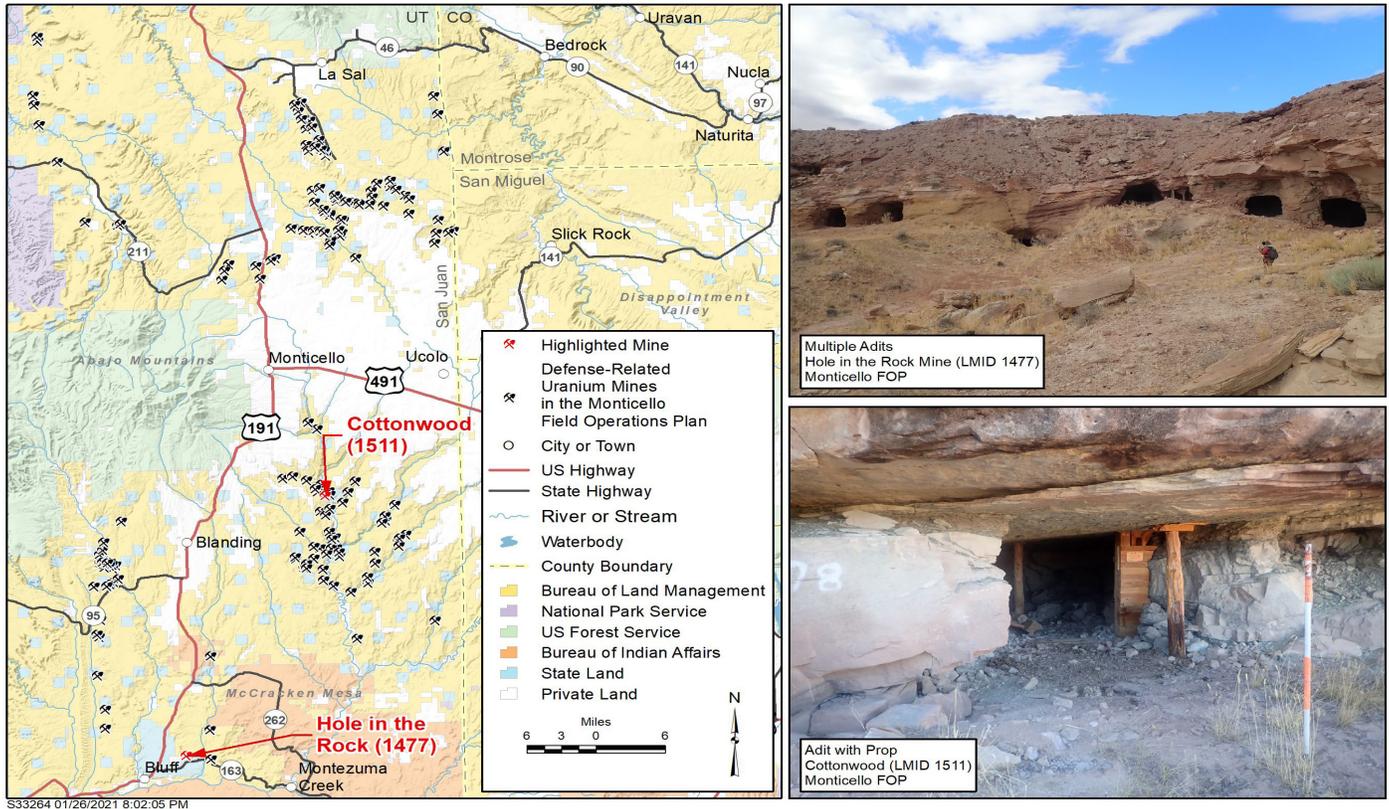


Figure 7. Map and Photos, Hole in the Rock Mine (upper) and Cottonwood Mine (lower) Monticello FOP.

San Rafael Mining District FOP: This project area is in eastern-central Utah west of the city of Green River, in Emery and Wayne counties, Utah. The FOP area consists of 124 mines on BLM-administered land, SITLA public land administered by the state of Utah, and mixed-ownership land. Twenty mines were visited in this FOP in 2020, completing work in this project area. Field work was limited to the spring and fall due to the intense desert heat in the summer.

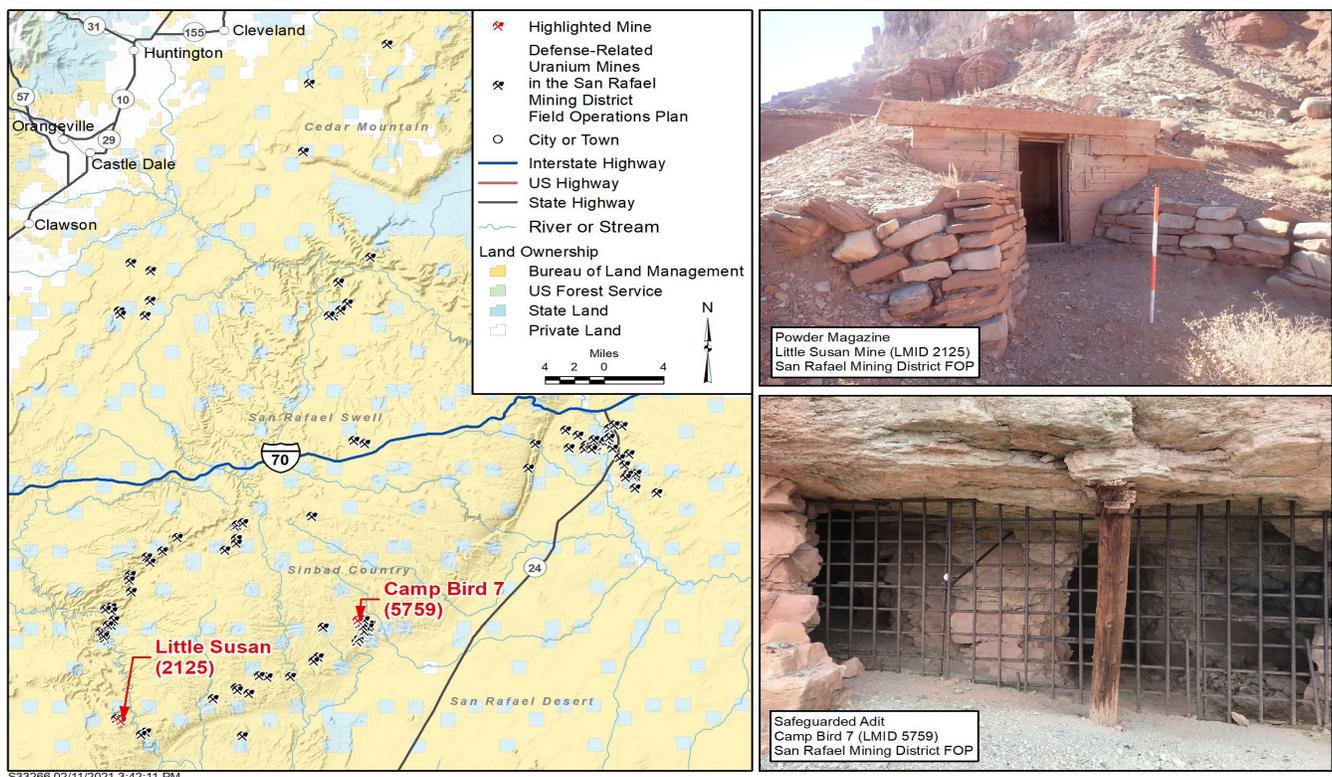


Figure 8. Map and Photos, Little Susan Mine (Upper) and Camp Bird 7 Mine (Lower) San Rafael Mining District FOP

IV Programmatic Accomplishments

In 2020, the program experienced some unique challenges. This year was especially unique given the onset of the coronavirus disease of 2019 (COVID-19) across the country. Many of the transactional activities of LM were deferred to alleviate exposure to and transmission risk of COVID-19 with the safety and well-being of agency employees, contractors, and the public in mind. LM worked with state and local health authorities to minimize the risk of COVID-19 transmission and considered the unique circumstances of each operating location. Individual state and tribal orders were reviewed for exemptions and permissible essential activities. In addition, site-specific regulatory requirements were reviewed to determine what could be completed within the constraints of the orders. LM developed their *COVID-19 Response Plan for a Safe Federal Workplace* (DOE 2021) (COVID-19 Response Plan) to establish and implement their response to this pandemic. While continuing to deliver mission-essential services to the greatest extent practicable, LM followed guidance from the Department, Executive Orders, the U.S. Office of Management and Budget, the U.S. Centers for Disease Control and Prevention, the U.S. Office of Personnel Management, and the U.S. General Services Administration.

Nevertheless, the DRUM Program met this challenge head-on and had a successful year. Every facet of the program, including management, reconciliation, field and report staff, data and records management, environmental, safety, health and quality assurance, stakeholder engagement, business services (e.g., technical editing), and project services (e.g., analytical laboratory) (Figure 9), contributed to its success. The DRUM team has essentially built a “center of excellence” that provides thoughtful leadership; best practices and expertise; strategic partnerships; and meaningful engagement, research, support, and training for the inventory, assessment, and safeguarding of abandoned defense-related uranium mines.



Figure 9. The DRUM Team in 2019

The following programmatic activities were accomplished in calendar year 2020:

- **January 2020**
 - Participated in the Federal Mining Dialogue meeting hosted by the U.S. Environmental Protection Agency (EPA), receiving an update from U.S. Geologic Survey (USGS) on their Mineral Deposit Database project and their study attempting to use high-resolution satellite data to differentiate uranium mine features from naturally occurring features.
 - Met with Freeport-McMoRan Inc. (Freeport), a large mining company, to assess the overlap of the DRUM Program with their reclamation efforts. Freeport is safeguarding physical hazards on abandoned mines in Colorado to which they have historical owner or operator ties.
 - Revised the FOP for the Gateway Mining District. This plan covers 209 mines in Grand County, Utah, and Mesa County, Colorado, on land administered by BLM on ULP leases and private property.
- **February 2020**
 - Steven H. Brown, DRUM Program subcontractor, published a final paper along with Brent Lewis and John Elmer entitled, “Development of Radiological Screening Levels and Associated Gamma Survey Methodologies for Radiological Characterization at U.S. DOE Office of Legacy Management Defense-Related Uranium Mine Sites” (Brown et al. 2020).
 - Conducted “spring training” in preparation for the upcoming field season. Training topics included updates to the *Defense-Related Uranium Mines Safety Plan* (LMS/DRM/S15804) (Safety Plan), field hazards, changes to the DRUM V&V Work Plan, vehicle maintenance, claim mapping, sampling, risk roll-up reports, equipment use and calibration, and safety data sheets.

- Prepared for the International Atomic Energy Agency (IAEA) Technical Meeting on the Management of Remediated Areas to be held in Grand Junction, Colorado, in July 2020. Because of LM’s experience with abandoned uranium mines and mills, LM planned to provide technical support to IAEA efforts to address areas of uranium mining and milling in the former Central Asian Republics of the Soviet Union. This meeting was postponed by IAEA to Summer 2021 due to COVID-19 and will be held virtually.

- **March 2020:**
 - V&V fieldwork for the DRUM Program began on March 2, 2020 and continued through March 16, 2020. During this timeframe, field V&V activities were completed at a total of 41 mines. Field work was put on hold due to health considerations associated with the COVID-19 pandemic. LM assumed a minimum safe (MIN-SAFE) posture according to its COVID-19 Response Plan, requiring all staff to maximize teleworking.

 - Updated the *2020-2030 Strategic Plan, Defense-Related Uranium Mines Program* (DOE 2020b) to reflect programmatic updates and progress.

 - Updated the *Defense-Related Uranium Mines Program Management Plan 2020-2030* (LM Plan 3-23-1.0, LMS/DRM/S15809) (Program Management Plan).

 - Completed the FOP for Arizona statewide. This FOP covers 54 mines across Arizona on land administered by BLM, USFS, the state of Arizona, the U.S. Bureau of Reclamation, and on mixed-ownership land.

 - Completed the FOP for the Henry Mountains Mining District. This FOP covers 125 mines throughout southeastern Utah on land administered by BLM, SITLA, USFS, and on mixed-ownership land.

 - Completed the FOP for the Monticello Mining District. This plan covers 180 mines in Utah on land administered by BLM, SITLA, and on mixed-ownership land.

 - Briefed senior legislative assistant to Congressman Tom O’Halloran on the DRUM Program and its plan for future V&V work on land managed by the state of Arizona and on Navajo Nation land during Campaign 2.

 - Revamped and updated the DRUM Program website to ensure that it reflects what is happening in the field. It now includes key program documents and information on program progress, ongoing projects, the safeguarding program, and the Abandoned Uranium Mines Working Group (AUMWG).

 - Uranium Mine Team Lead served as session co-chair for a technical track, “Environmental Remediation Post Closure Challenges and Long-Term Stewardship,” at the Waste Management Symposia.

- Chaired the quarterly AUMWG meeting discussing the following topics with federal agencies: 1) use of USGS data, 2) collection of abandoned mine owner and operator information, and 3) release of the AUMWG website.
- **April 2020:**
 - No V&V activities occurred in April because of COVID-19. However, teleworking continued in accordance with the COVID-19 Response Plan. In the meantime, field teams constructed ecology tables, performed data quality assurance, updated work plans and procedures, performed preliminary planning activities for future V&V activities, supported reconciliation with claim boundary mapping, developed draft FOPs, continued education and safety training, and conducted mapping and planning activities associated with the geographic information system.
 - Updated the FOP for the Moab Mining District. This plan covers 46 mines in Utah on land administered by BLM and SITLA and on private and mixed-ownership land.
- **May 2020:**
 - Restarted fieldwork for the DRUM Program on May 18, 2020, in accordance with limited operations (LTD-OPS) Step 1 of LM's COVID-19 Response Plan, with only one team in the field per day. Fieldwork began in the Gateway Mining District in Colorado.
 - Finalized the V&V Work Plan.
 - Participated in the 2020 Interagency Abandoned Mine Safety Training Course, which is held annually by BLM, USFS, the National Park Service, and the Mine Safety and Health Administration, addressing topics such as surface and underground mine features and hazards. As part of this virtual training, two presentations on radiological hazards were given:
 - *A Radiological Science and Radon Primer*, which was also presented at the AUMWG annual meeting held in Denver, Colorado, on November 3-4, 2019.
 - *Development of Radiological Screening Levels and Associated Gamma Survey Methodologies for Radiological Characterization at US DOE Office of Legacy Management Defense-Related Uranium Mine Sites*.
 - Updated the DRUM Program's risk screening process using BLM's *Decision-Making Manual/Risk-Based Ranking Strategy for Utah Abandoned Mine Sites* (BLM 2019) to include removal management levels in addition to recreational screening levels (RSLs) to better support partner agency decisions. These additional screening benchmarks augment the RSLs to better identify DRUM sites where risk from long-term exposure is more likely.

- Delivered a reclamation project proposal to a delegation in the Republic of Palau (an island country in the western Pacific Ocean) outlining options for addressing damage resulting from legacy bauxite mining. Proposed a phased approach and recommended actions such as surface roughening, soil amendments, sediment traps, microclimates, and revegetation.
 - Presented an overview of the DRUM Program to the San Miguel County Board of Commissioners. Engagement led to an emergency safeguarding of a subsidence feature identified by a participating private citizen.
- **June 2020:**
 - On June 8, 2020, fieldwork for the DRUM Program continued at the Gateway Mining District in Colorado. Overnight stays were authorized as LM moved into LTD-OPS Step 2 of their COVID-19 Response Plan.
 - Developed a *Defense-Related Uranium Mines Risk Screening Process* (DOE 2020c) guidance document, providing a programmatic means to consistently evaluate and rank risk in order to identify the most significant hazards associated with a mine or group of mines in the DRUM Program.
 - Completed the FOP for the Bull Canyon, Uravan, and Paradox mining districts. This plan covers 43 mines along the border between Colorado and Utah on land administered by BLM, ULP leases, and on mixed-ownership land.
 - Chaired the quarterly AUMWG meeting discussing the following topics with federal agencies: 1) impacts of COVID-19 on Abandoned Mine Lands (AML) field activities, 2) use of EPA’s aerial survey program, and 3) update to EPA’s 10-Year Plan: “Federal Actions to Address Impacts of Uranium Contamination on the Navajo Nation.”
 - Completed the following risk roll-up reports: Martin Mesa, Colorado; and Deer Flat, Utah.
- **July 2020:**
 - On July 13, 2020, fieldwork for the DRUM Program continued in the Gateway Mining District in Colorado and expanded to the Monticello Mining District in Utah. Overnight stays were authorized as LM moved into LTD-OPS Step 3 of their COVID-19 Response Plan.
 - Accomplished the 1,000th V&V field visit, the honor going to the Mineral Channel 3 mine on Outlaw Mesa on land managed by BLM’s Grand Junction Field Office.
 - Coordinated a field visit to the Los Ochos Mine for faculty members and graduate student from Western Colorado University. The purpose of the visit was to initiate conversations

related to the university's research on abandoned uranium mines that is being performed in collaboration with LM and the Legacy Management Support (LMS) contractor.

- Completed the FOP for the Bull Canyon Mining District. This plan covers 123 mines in Colorado on land administered by BLM and on mixed-ownership land.
- Completed the following risk roll-up reports: White Canyon District, Utah; San Isabel and Rio Grande National Forests, Colorado; USFS New Mexico statewide (Carson, Gila, and Santa Fe national forests) and Cibola National Forest, New Mexico.
- Met with the National Nuclear Security Administration's Aerial Measuring System to assess possibilities of utilizing their expertise in providing a helicopter-based gamma survey over very large DRUM sites in Wyoming.
- **August 2020:**
 - DRUM field team located and communicated to BLM a mining-related physical hazard at the Blue Ribbon 1 & 2 Mine. The subsidence feature was along a well-travelled four-wheel-drive road and was partially fenced. Notification allowed the BLM Colorado State Office to contract for its safeguarding.
 - Published and posted the *DRUM Program Midyear Progress Report, January 1-June 30, 2020* (DOE 2020e) on the public-facing website.
 - Completed the following risk roll-up reports: High Desert District, Wyoming; Royal Gorge Field Office, Colorado; Colorado River Valley, Colorado; Placerville District, Colorado; and Spring Creek Mesa Locality, Colorado.
- **September 2020:**
 - Secured the Bat Conservation International (BCI) cooperative agreement which provides long-term access to the spectrum of project development, environmental review (including NEPA documentation), and design and construction services needed to safeguard mines on public land.
 - Worked with counterpart at the Ute Mountain Ute Tribe to provide information on DRUM sites within the buffer boundaries of the White Mesa Community near Blanding, Utah. There are no DRUM sites within the Ute Mountain Ute reservation boundaries.
 - Met with staff from El Paso Natural Gas (EPNG) to learn from their ongoing operational experiences in addressing legacy uranium mines on Navajo Nation land. EPNG has a settlement agreement with EPA for mine assessments and interim removal actions for 19 mines near Cameron, Arizona.

- Renewed cooperative agreements with Colorado DRMS and Utah Division of Oil, Gas, and Mining (Utah DOGM)/Abandoned Mine Reclamation Program (AMRP) authorizing scope and funds for V&V and safeguarding activities at DRUM sites.
 - Worked with Environmental Compliance to process an administrative categorical exclusion to facilitate safeguarding activities on AML managed by federal land management agencies.
 - Chaired the quarterly AUMWG meeting discussing the following topics with federal agencies: 1) use of aerial surveys on large mines in Wyoming, 2) upcoming schedule of V&V and safeguarding activities, and 3) incorporation of removal management levels into DRUM risk assessments.
 - Completed the following risk roll-up reports: Carpenter Ridge and Rock Creek Localities, Colorado; and La Sal Creek Locality, Colorado.
- **October 2020:**
 - Completed the first pilot safeguarding project, the Long Park Project, on land managed by the BLM UFO in Montrose County, Colorado. The project was a team effort with LM providing funding, BLM accomplishing NEPA documentation, and DRMS executing the design and construction contracting.
 - Published the 1,000th mine-specific V&V report, the honor going to the aptly named Blue Ribbon 3 Mine in the Gateway Mining District on land managed by the BLM Grand Junction Field Office.
 - Supported USGS with their uranium assessment project, providing data on DRUM sites with high gamma radiation readings. Provided information that proved critical to planning and narrowing USGS fieldwork in the Yellow Cat, Temple Mountain, Lisbon Valley, Monument Mesa, and Bull Canyon areas in Colorado and Utah.
 - Submitted the *Report on Select Dose Monitoring of LMS DRUM Project Personnel* (DOE 2020f), revealing that dose values for personnel assigned to V&V work activities were substantially less than the federal dose limit of 5,000 millirem per year (mrem/yr) for occupational workers and significantly less than the 100 mrem/yr dose limit for members of the general public.
 - Completed the following risk roll-up reports: BLM New Mexico statewide, New Mexico; and Buckmaster Draw Area, Utah.
 - **November 2020:**
 - The following five safeguard projects were completed under the auspices of the DRUM Program:
 - OIG Buckmaster in Emery County, Utah.

- White Canyon/Deer Flat in San Juan County, Utah.
 - Temple Mountain Maintenance in the San Rafael Mining District, Utah.
 - Bald Eagle in San Miguel County, Colorado.
 - Klondike Basin in San Miguel County, Colorado.
- Assisted BLM on an emergency safeguard project at the Main Street Mine on public land managed by the BLM Tres Rios Field Office. A subsidence feature encroaching on an adjacent county road was safeguarded.
 - Completed the Beaver Mesa Locality, Utah risk roll-up report.
- **December 2020:**
 - Participated as a voting member in the fall meeting of Colorado’s advisory council for the inactive mine reclamation program. Reviewed major accomplishments, summary public participation in outreach efforts, and list of program amendments effectuated this past year. Voted on statewide priorities for reclamation of coal and abandoned mines.
 - Chaired the quarterly AUMWG meeting discussing the following topics with federal agencies: 1) safeguarding project update, 2) reconfirmation of the *Abandoned Uranium Mines Working Group Addressing Health and Safety Risks of Abandoned Uranium Mines Multiagency Strategic Plan* (AUMWG 2020), and 3) preparing the *Abandoned Uranium Mines Working Group Annual Stakeholder Report January 1-December 31* (AUMWG 2021). The annual face-to-face meeting was cancelled due to COVID-19.
 - Completed the following risk roll-up reports: Tenderfoot Mesa Locality, Colorado; Flat Top Mesa Locality, Colorado; Blue Mesa Locality, Colorado.

V Risk Screening

To date, program results indicate that physical hazards (e.g., open shafts and adits) at the mines pose the greatest risk to the public, with roughly 26% of the mines ranked “high” for physical hazards. This suggests the need for a future safeguarding action to mitigate the risk presented by these features. Over 54% of the mines ranked “low” or “none” for physical risk. These estimates represent mining-related physical hazards associated with uranium ore extraction operations. Other hazardous features, such as structures, which have previously been included in evaluations of physical risks, were not considered. However, LM will address the handling of structures individually with each land management agency, since each agency tends to address these differently, if at all.

Mine reports are prepared for each mine, and risk roll-up reports are prepared for a group of mines in the same area (e.g., mining district, national forest) so land management agencies can set priorities for that region and develop potential physical hazard safeguarding projects.

VI Safeguarding

The DRUM Program assisted land management agencies in safeguarding physical hazards posed by some mine features at six different project areas in western Colorado and eastern Utah. These hazards were primarily open adits, shafts, and subsidence features. Table 2 summarizes the 2020 safeguard projects and cooperating land management agencies and state AML offices. These safeguarding projects demonstrate the collaborative relationships between the DRUM Program and cooperating state AML offices and land management agencies.

Table 2. 2020 Safeguarding Projects

State	Project Area	Features Safeguarded	Cooperating AML Office	Cooperating Land Management Agency
Utah	OIG Buckmaster	46	Utah/AMRP	BLM Price Field Office
Utah	White Canyon/Deer Flat	83	Utah/AMRP	BLM Monticello Field Office
Utah	Temple Mountain	12	Utah/AMRP	BLM Price Field Office
Colorado	Long Park	26	DRMS	BLM Uncompahgre Field Office
Colorado	Bald Eagle	20	DRMS	BLM Tres Rios Field Office
Colorado	Klondike Basin	20	DRMS	BLM Tres Rios Field Office
	Total Safeguards Installed	207		

AMRP – Abandoned Mine Reclamation Program

DRMS – Division of Reclamation, Mining and Safety

VII Strategic Partnerships

LM strives to maintain and encourage collaborative partnerships with BLM, USFS, and the states of Colorado, New Mexico, South Dakota, Utah, and Wyoming. LM also collaborates with EPA Regions 6 and 9 on program V&V assessment and risk screening methods. LM continues to revise partnership agreements among the various federal and state entities to not only accomplish the V&V work, but also safeguard physical safety hazards at these abandoned uranium mines. Most notably in 2020, DOE established a cooperative agreement with BCI, which provides long-term access to the spectrum of project development, environmental review (including NEPA documentation), and design and construction services needed to safeguard mines on public land.

Collaboration with a multitude of federal and state entities on the DRUM Program supports a one-government approach with financial agreements that provide access to agency expertise involving managing abandoned mines on public land and critical input into work plans, schedules, data reviews, conclusions, and safeguarding projects. State AML programs in Colorado and Utah have been used to inventory private property intermixed with public land, providing valuable planning information needed to support the DRUM Program.

VIII 2021 Planned Activities

LM will be nearly finished with Campaign 1 by the end of FY 2022. Reconciliation of all DRUM locations will be completed during FY 2021. Plans for substantially completing Campaign 1 field visits are currently on schedule. LM will pursue expanding its partnerships with states and agencies for field activities scheduled through FY 2022. Included in the implementation of Campaign 1 is LM's plan to leverage resources to assist partner agencies in addressing priority physical hazards that are identified by the program. Through a process of collaboration and concurrence with hazards defined during V&V activities, LM and partner agencies determine the priority and optimize available resources for safeguarding physical hazards. This process, which was initiated in 2020, will continue at an accelerated pace in 2021.

V&V Field Operations

The field teams will be deployed to several locations over the course of the 2021 field season, which lasts from March through December. The teams are scheduled to conduct inventory and environmental sampling at DRUM sites in:

- Bull Canyon, Uravan, and Paradox Mining Districts of the Colorado UFO.
- Bull Canyon Mining District, Colorado, BLM Tres Rios Field Office.
- Green River Mining District, Utah.
- Gypsum Valley Mining District, Colorado.
- Henry Mountains Mining District, Utah.
- Manti-La Sal National Forest, Grand and San Juan Counties, Utah and Montrose County, Colorado.
- Moab Mining District, Utah.
- Monticello Mining District, Utah.
- Northern Montrose County, Colorado.
- Northern Slick Rock Mining District, Colorado.
- Southern Slick Rock Mining District, Colorado.

The field teams are poised to complete V&V activities on at least 500 mines in calendar year 2021. For each project, a FOP will provide coordination instructions to the teams for the inventory and environmental sampling activities so that field work is conducted efficiently. The FOP conveys to LM, the LMS contractor, and partner agencies information that is pertinent to the V&V activities being undertaken at the specific project area. Also, contingencies are in place to ensure that field teams always have a DRUM site to inventory and assess. Although a field team may be impacted by weather (e.g., late seasonal snow) or a natural disaster (e.g., smoke from a wildland fire), they will have other options allowing them to safely continue field work.

Campaign 2

Development of Campaign 2, which will address DRUM sites on tribal land, will be integrated into Campaign 1 starting with tribal outreach in FY 2021. Interagency collaboration for Campaign 2 will be designed to augment the ongoing abandoned mine lands programs of partner agencies with responsibility for these lands (e.g., EPA, U.S. Bureau of Indian Affairs, and tribal AML programs).

2021 Safeguard Program

LM is working to safeguard the public from hazardous features identified during Campaign 1 V&V activities at DRUM sites. LM is teaming with affected land management agencies and state AML offices to accomplish this goal. During 2021, LM will work with land management agencies in

Colorado, Utah, and New Mexico along with Utah AMRP and Colorado DRMS to initiate hazardous mine feature safeguarding projects in all three states. Figure 10 shows an example of an adit safeguard. LM may also begin monitoring previously completed safeguards in 2021.

Safeguarding projects are initiated as a follow-up to DRUM Program–generated risk roll-up reports, which document physical hazards presented by individual features at mines where V&V and follow-up reporting has been completed. LM will work with affected land management agencies as they concur with the need to safeguard specific mine features in specific geographic areas. Land management agencies, state AML offices, and LM via the LMS contractor or BCI will collaborate to complete environmental reviews, develop designs and construction specifications, and contract and manage safeguard construction.



Figure 10. Adit safeguarded with bulkhead and bat-accessible grate (Klondike Basin Safeguarding Project, Photo Courtesy of DRMS)

IX Program Plans

The activities performed by the DRUM Program are represented in multiple documents that provide specific guidance and direction in the performance of tasks or project activities. These documents are the DRUM Program Management Plan, the V&V Work Plan, the *Defense-Related Uranium Mines Quality Assurance Program Plan* (LMS/DRM/S15867) (QAPP), the DRUM Safety Plan, the FOPs, and the *Defense-Related*

Uranium Mines Data Management Plan (LMS/DRM/S19467) (Data Management Plan). The DRUM Program added another programmatic document, the *DRUM Safeguarding Program Management Plan* (LMS/DRM/S33217), which will be published in FY 2021. A summary of each plan is provided below:

Program Management Plan

The Program Management Plan defines how LM will execute the DRUM Program, set goals, and effectively communicate program strategies and objectives to the partner agencies. It is the primary guiding document of the program. A revised Program Management Plan was issued in March 2020. The revised plan addressed V&V activities for the three DRUM campaigns, including safeguarding of physical safety hazards. It describes how LM, the LMS contractor, and partner agencies will work as a cohesive team to execute the DRUM Program.

Verification and Validation Work Plan

The V&V Work Plan provides data objectives, direction, and methodologies regarding how LM and partner agencies will collect, store, and report information gathered during V&V activities at mines on public land. This includes inventorying mine-related features using digital technology, radiological data collection, soil and water sampling (if required), photo documentation of mine-related features, in-field and office-based data quality assurance procedures, and reporting.

Quality Assurance Program Plan

The QAPP describes the procedure for ensuring that environmental data collected during V&V activities at a mine will be of sufficient quantitative and qualitative value for use in determining whether data-quality objectives are being met. The data provided to partner agencies will be used to supplement existing documentation of mine conditions.

Safety Plan

The Safety Plan defines the requirements of the LMS Worker Safety and Health Program and the Integrated Safety Management System. These are high-level programs that set forth the parameters for how the LMS contractor integrates safety into program activities. The DRUM Safety Plan replaced the previous DRUM Health and Safety Plan in Spring 2020.

Field Operations Plans

The FOPs provide the details of activities to be performed on lands administered by partner agencies within discreet operational areas. Each FOP provides contact information for the relevant personnel from LM, the LMS contractor, and partner agencies; identifies the mines where V&V activities will be performed; provides information pertinent to mine access; describes special circumstances and restrictions that need to be addressed before, during, or after V&V activities; and includes emergency contacts and locations of medical facilities nearby where V&V activities are being performed.

Data Management Plan

The Data Management Plan describes the tasks, processes, and procedures for managing DRUM Program data. This plan identifies responsibilities, outlines data sources and locations, and provides insight on the quality control checks, capabilities, and queries that can be done related to the DRUM Program database.

Safeguarding Program Management Plan

The Safeguarding Program Management Plan is being developed. This plan will address how LM, in collaboration with land management agencies, state and tribal AML offices, the LMS contractor, and BCI will implement safeguarding and follow-up monitoring and maintenance activities.

X Abbreviations List

AEC	U.S. Atomic Energy Commission
AML	Abandoned Mine Lands
AMRP	Abandoned Mine Reclamation Program
AUMWG	Abandoned Uranium Mines Working Group
BCI	Bat Conservation International
BLM	U.S. Bureau of Land Management
DRMS	Division of Reclamation, Mining and Safety
COVID-19	coronavirus disease of 2019
DOE	U.S. Department of Energy
DRUM	Defense-Related Uranium Mines
EPA	U.S. Environmental Protection Agency
EPNG	El Paso Natural Gas
FOP	Field Operations Plan
FY	fiscal year
IAEA	International Atomic Energy Agency
LM	Office of Legacy Management
LMS	Legacy Management Support
LTD-OPS	limited operations
mrem/yr	millirem per year
NEPA	National Environmental Policy Act
QAPP	Quality Assurance Program Plan
SITLA	School and Institutional Trust Lands Administration
UFO	Uncompahgre Field Office
ULP	Uranium Leasing Program
UMREG	Uranium Mining Remediation Exchange Group
Utah OGM	Utah Division of Oil, Gas, and Mining
USFS	U.S. Forest Service
USGS	U.S. Geologic Survey
V&V	verification and validation

XI Additional Information

Additional information about the DRUM program, including the 2014 Report to Congress, other program documents, ongoing projects, and updates, is available at the following DOE website: <https://www.energy.gov/lm/defense-related-uranium-mines-program>

For more information about the DRUM Program, please contact:

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